
MEDIUM-CLASS EXPLORER PROGRAM

GUIDELINES AND CRITERIA FOR THE

PHASE A CONCEPT STUDY

May 16, 2002

GUIDELINES AND CRITERIA FOR THE PHASE A CONCEPT STUDY

INTRODUCTION

It is planned that a subset of proposed investigations from the Medium-class Explorer (MIDEX) Announcement of Opportunity (AO) will be selected and awarded contracts for Phase A concept studies. The concept study will constitute the investigation's requirements definition phase (Phase A) of the formulation subprocess as outlined in NPG 7120.5A, *NASA Program and Project Management Processes and Requirements*. The purpose of a concept study is to better define the investigation, its implementation requirements, and its risks, as well as to describe the plans for education and public outreach, small disadvantaged businesses, and new technology. Upon completion of the concept study, proposers will submit a Concept Study Report (CSR) for NASA evaluation. The CSR is to be a self-contained document; that is, selected investigators must not assume that NASA evaluators will have reviewed or even have access to the original proposal.

The CSR is due by 4 p.m. EST October 16, 2002, at:

MIDEX Concept Study Support Office
NASA Peer Review Services
500 E Street, SW
Suite 200
Washington DC 20024
202-479-9030

Please note that all program constraints, guidelines, definitions, and requirements given in the AO are still valid for the CSR except as noted herein.

Part I of this document discusses the criteria to be used by NASA for the evaluation of the CSR's. Part II provides guidance for preparation of the CSR's. Appendix A provides definitions of cost element terms used in the cost plan section of this document. Appendix B provides evaluation criteria, requirements, and guidelines for the Education and Public Outreach aspects of the CSR.

PART I - EVALUATION CRITERIA

The NASA evaluation of the Concept Study Reports will be conducted in much the same fashion as the evaluation of the proposals as discussed in Section 7.0 of the AO. However, in addition to considering any changes to the science objectives from those in the phase one proposal, this evaluation will consider in detail all factors related to the probability of mission success and to the realism of the proposed costs to NASA. This evaluation will also consider other factors that enhance the return on NASA's investment in the investigation such as education and public outreach, new technology transfer and infusion, small disadvantaged business activities and the involvement of minority institutions. It is expected that plans for these elements of the investigations will be taken to the next level of detail and maturity along with the development of the science, engineering, and cost.

Successful implementation of the MIDEX Program demands, in addition to scientific merit, that the investigation be achievable within the established constraints on cost and schedule. The information requested in Part II of this document will enable the evaluation panel to determine how well each mission team understands the complexity of its proposed investigation, its technical risks, and any weaknesses that require specific action during Phase B.

The criteria for evaluating the concept study are as follows:

- Scientific merit of the proposed investigation
- Technical merit and feasibility of the proposed investigation
- Feasibility of the proposed approach for mission implementation, including cost risk
- Quality of plans for education and public outreach (E/PO)
- Quality of plans for advanced technology infusion and transfer
- Quality of plans for small disadvantaged business activities and involvement of minority institutions.

The first two criteria are the same as described in Section 7.2 of the AO. The science objectives must not change from those given in the proposal. Any changes to science implementation will be carefully evaluated. If there are no substantive changes in the science implementation, then the scientific merit of the proposed investigation (first criterion) and the technical merit of the science investigation (half of second criterion) will not be reevaluated. In this case, the evaluations of scientific merit and of technical merit of science implementation of the original proposal will be used. Assuming that there are no changes to the proposed science or its implementation, the emphasis of the evaluation will be on the technical feasibility of the science implementation (other half of the second criterion) and on the latter four criteria, more fully described below. Of these criteria, the feasibility of proposed approach for mission implementation, including the technical feasibility of the science implementation, is of more importance than the combination of the other three criteria. E/PO is as important as the combination of the last two criteria, which are of equal importance. Total cost to NASA OSS will be a selection but not an evaluation criterion.

Feasibility of the Proposed Approach to Mission Implementation, including Cost Risk

The information requested in Part II of this document will be used to evaluate each investigation in detail for the feasibility of mission implementation as reflected in the perceived risk of accomplishing the mission within proposed resources. The mission feasibility criterion in the AO will be supplemented with the following considerations:

The technical and management approaches will be evaluated to assess the likelihood that the investigation can be implemented as proposed. This will include an assessment of the risk of completing the investigation within the proposed cost. The evaluation will consider implementation factors such as the proposed launch vehicle including reliability, mission design, spacecraft design, and design margins, and the proposers' understanding of the processes, products, and activities required to accomplish development and integration of all elements (flight systems, ground and data systems, etc.). It will also consider the adequacy of the proposed approach, the organizational structure, the roles and experience of the known partners, the management approach, the commitments of partners and contributors, and the team's understanding of the scope of work (covering all elements of the mission, including contributions). The relationship of the work to the project schedule, the project element interdependencies, and associated schedule margins will also be evaluated. Investigations proposing new technology will be penalized for risk if adequate backup plans to ensure success of the mission are not described. The proposal must discuss the methods and rationale (cost models, cost estimating relationships of analogous missions, etc.) used to develop the estimated cost and must include a discussion of cost risks. Innovative cost effective features, processes, or approaches will be rewarded if proven sound.

The evaluation will consider the proposer's understanding of the processes, products, and activities required to accomplish development of all elements (e.g., flight systems, ground and data systems, etc.), the integration of all elements, and the adequacy of the proposed approach including reserves and margins. The technical approach will be examined in its entirety to ensure that: (1) all elements and processes are addressed, (2) weaknesses and design issues are understood and plans for resolution have been identified, (3) fundamental design trades have been identified and studies planned, and (4) primary performance parameters have been identified and minimum thresholds established. GFE, as defined in the AO, will be assessed to verify that it is being used within its intended capability. The overall approach (including schedule), the specific design concepts, and the known hardware/software will be evaluated for soundness, achievability, and maturity. Resiliency and design performance margins will be factors in this evaluation. Proposers must address how developmental problems with new technology will be addressed in order to ensure mission success. The experience and expertise of the development organizations will be important factors in assessing the probability of success. Innovative cost effective features, processes, or approaches will be rewarded if proven sound.

The credibility and realism of the cost estimates and the planned financial resiliency will be evaluated. The underlying rationales for the cost estimates, including reserves, and the development schedule, including schedule margins, will be factors in this evaluation. The adequacy of reserves in the context of the recommendations of the NASA Integrated Action Team (NIAT) are also factored into this evaluation.

The information provided in the Management section must demonstrate the proposer's plans, processes, tools, and organization for managing and controlling the development and operation of the mission, including performance measurement and reporting. The soundness and completeness of the approach and the probability that the management team can assure mission success will be evaluated by reviewing the organizational structure (including roles, responsibilities, accountability, and decision making process) and the processes, plans, and strategies the team will use to manage the various mission elements through all phases of the mission. Factors in this evaluation will include: clear lines of authority, clean interfaces, prudent scheduling and cost control mechanisms, review processes, and demonstrated awareness of all necessary management processes. The adequacy with which risk management activities are planned and budgeted incorporating the recommendations of the NASA Integrated Action Team (NIAT) Report, are also factored into this evaluation. Additional factors in the evaluation of the probability of mission success will include the experience, expertise, and commitment of key personnel and the organizations to which they are attached, the adequacy of facilities and equipment proposed for the mission, the adequacy of the team's approach to risk management, and the adequacy of the management and control mechanism. Innovative management processes and plans will be rewarded if proven to be sound.

The completeness of the Phase B plans will be considered in determining the adequacy of the Phase B approach. This will include an evaluation of the activities/products, the organizations responsible for those activities/products, and the schedule to accomplish the activities/products.

Quality of Plans for Education and Public Outreach

All proposed investigations must include an Education/Public Outreach component as part of their Concept Study Report. The criteria to be used to evaluate the E/PO component are given in Appendix B of this document. See also section 3.7 of the AO, and section H1 and Appendix B of this document for further details on the E/PO requirements.

Quality of Plans for Advanced Technology Infusion and Transfer

The technology plan will be reviewed to determine the extent to which it meets the requirements given in section 3.8.1 of the AO. See section H2 of this document for further information.

Quality of Plans for Small Disadvantaged Business Activities and involvement of Minority Institutions.

The small disadvantaged business plan will be evaluated to determine the extent to which it meets the participation requirements and goals given in section 3.8.2 of the AO. See section H3 of this document for further information.

PART II - REQUIRED QUANTITIES, MEDIA, FORMAT, AND CONTENT

Forty paper copies of the Concept Study Report are required. An additional 25 copies of the Fact Sheet (see Section C, below) are required. It is required that each paper copy of the CSR be accompanied by a CD containing an electronic version of the CSR in a single file to facilitate searching for specific information (the PDF format is preferred). The required uniform format and contents are summarized below. Failure to follow this outline may result in reduced ratings during the evaluation process.

When changes have been made to any data provided with the original proposal as a result of the concept study, these changes from the proposal must be clearly identified. The content of each requirement is discussed in the subsequent paragraphs. Note that all program constraints, guidelines, requirements, and definitions given in the AO are still valid for the Concept Study Report except as noted herein.

The CSR shall contain no more than 132 pages, including no more than seven foldout pages (28 x 43 cm; i.e., 11 x 17 inches). Three-ring binders may be used.

- A foldout page counts as one page
- All pages other than foldout pages shall be 8.5 x 11 inches or A4 European Standard
- Single- or double-column format is acceptable.
- In complying with the page limit, no page may contain more than 55 lines of text and the type font must not be smaller than 12-point except within figures and tables, where the type font must not be smaller than 10-point.

The following page limits apply:

Section	Page Limit
A. Cover Page and Investigation Summary	No page limit, but be concise
B. Table of Contents	2
C. Fact Sheet	2
D. Executive Summary	5
E. Science Investigation (changes highlighted)	25
F. Technical Approach G. Management Plan H. Education, Public Outreach, New Technology, and Small Disadvantaged Business Plans I. Phase B Plan	98
J. Cost Plan for Phases A through E	No page limit, but data must be presented in formats described; be brief
K. Changes required for and implications of being the second MIDEX launched under this AO.	No page limit, but be brief
L. Justification and Cost Plan for any Phase F Activities	No page limit, but data must be presented in formats described; be brief and concise
M. Appendices (No other appendices permitted) 1. Letters of Endorsement 2. Relevant Experience and Past Performance 3. Resumes 4. Statement(s) of Work for Each Contract Option 5. Mission Definition and Requirements Agreement 6. Orbital Debris Analysis 7. Data Management Plan 8. Any Incentive Plan(s) 9. Any NASA PI Proposing Team 10. Technical Content of Any International Agreements 11. Discussion on Compliance with U.S. Export Laws and Regulations – Update from Proposal 12. Acronyms List 13. Reference List (Optional)	No page limit, but small size encouraged

A. COVER PAGE AND INVESTIGATION SUMMARY

A Cover Page and Investigation Summary must be a part of the proposal, but will not be counted against the page limit. It must be signed by the Principal Investigator and an official by title of the investigator's organization who is authorized to commit the organization. Create a custom cover page which contains the following information. The full names of the Principal Investigator and the authorizing official, their addresses with zip code, telephone and fax numbers, and electronic mail addresses, are required, as well as the names, institutions, and E-mail addresses of all participants, the type of investigation proposed, the total NASA OSS Cost, and a 200-word Summary. A hard copy version of this Cover must be printed in time to acquire signatures and include with the original hard copy of the CSR.

B. TABLE OF CONTENTS

The CSR shall contain a table of contents that parallels the outline provided in Sections C through M below.

C. FACT SHEET

A Fact Sheet that provides a brief summary of the proposed investigation must be included. The information conveyed on the Fact Sheet must include the following: science objectives (including the importance of the science to the NASA science themes), mission overview (including mission objectives and major mission characteristics), science payload, key spacecraft characteristics, anticipated launch vehicle, major elements of the E/PO program, mission management (including teaming arrangement as known), schedule, and cost estimate. Other relevant information, including figures or drawings, may be included at the proposer's discretion. The Fact Sheet is restricted to two pages (preferably a double-sided single sheet).

D. EXECUTIVE SUMMARY

The Executive Summary is to be a summary of the contents of the CSR and is to include an overview of the proposed baseline investigation including its scientific objectives, the technical approach, management plan, cost estimate, education and public outreach, technology, and small disadvantaged business plans. The Executive Summary must be no more than 5 pages in length.

E. SCIENCE INVESTIGATION

This section shall describe the science investigation resulting from the Concept Study. Any descoping of, or changes to, the investigation from the baseline and minimum mission science defined in the proposal must be identified and the rationale for the change(s) given. Changes may be highlighted in bold with column marking for easy identification or may be provided in a change matrix giving the original (proposed) requirement, the new requirement, rationale for the change, and its

location within the CSR. If there are no changes, this section must be repeated identically from the proposal with a statement that there are no changes.

Special attention must be given to assuring that both the planning and resources are adequate to analyze, interpret, and archive all the data produced by the investigation in the appropriate data archive. Resources include cost, schedule, and work-hours for scientific interpretation of results and publication.

It is expected that changes will be required in the description of the science implementation, especially as relates to the criterion for feasibility. A page quota larger than that in the step 1 proposal has been allotted for this purpose.

F. TECHNICAL APPROACH

The Technical Approach section must detail the method and procedures for investigation definition, design, development, testing, integration, ground operations, and flight operations. A discussion of all new/advanced technologies planned for the investigation must be provided and include backup plans with scheduled decision criteria if those technologies cannot be made ready. This section must also detail the expected products and end items associated with each phase. Mission teams have the freedom to use their own processes, procedures, and methods. The use of innovative processes, techniques, and activities by mission teams in accomplishing their objectives is encouraged when cost, schedule, technical improvements, and risk containment can be demonstrated. The benefits and risks, if any, of any such processes and products must be discussed. This section must be complete in itself without the need to request additional data, although duplications may be avoided by reference to other sections of the CSR if necessary. For Missions of Opportunity, provide the information that is related to the proposed investigation's requirements on and interfaces with the sponsor's instrument/spacecraft. NASA will not be evaluating the sponsoring mission or spacecraft, however, it must have sufficient data about these to understand how the NASA funded project will be implemented and to evaluate the probability of scientific success.

1. Technical Approach Overview. This section must provide a brief overview of the technical approach including its key challenges.
2. Mission Design. This section must fully describe the operational phase of the mission from launch to end of mission. It must include information on the proposed launch date (including launch date flexibility), launch location and vehicle, trajectories, Delta-V requirements, orbit characteristics, mission duration, and a preliminary mission timeline indicating periods of data acquisition, data downlink, etc. The mission design must also describe the communications network to be used and interface requirements, along with potential impacts or conflicts with other users of the selected communications resources. Describe any design trade studies conducted or planned.

A "traceability matrix" showing how the proposed mission design complies with the stated objectives, requirements, and constraints of the proposed

investigation must be included. The rationale for the selection of launch vehicle must be included. The concept study must identify any innovative features of the mission design that minimize total mission costs.

3. Spacecraft. This section must describe the spacecraft design/development approach, particularly as it relates to new versus existing hardware and redundant versus single-string hardware. It must fully identify the spacecraft systems and describe their characteristics and requirements. A description of the flight system design with a block diagram showing the flight subsystems and their interfaces must be included, along with a description of the flight software and the approach for its development, and a summary of the estimated performance of the flight system. The flight heritage or rationale used to select the flight system and its subsystems, major assemblies, and interfaces must be described. The discussion of heritage must address two important issues: (1) prior flight experience or flight-qualified design of specific subsystem components, and (2) overall subsystem design, whether new, modified, or exact repeat of a design flown previously. Cost savings that result from heritage will be quantified and explained in the Cost Plan section (Section J) below. This section must also discuss the design *process* used: trade studies, simulations, technology development, engineering models, prototypes, etc.

Subsystem characteristics and requirements must be described to the greatest extent possible. Such characteristics include current best estimate and contingency for: mass, volume, and power requirements; pointing knowledge and accuracy; new developments needed; space qualification plan; and logistics support. These subsystems may include: structural/mechanical, solar array/power supply (and batteries), electrical, thermal control, propulsion, communications, attitude control, command, and data handling, etc. Any design features incorporated to effect cost savings must be identified; however, benefits must be specified and enabling assumptions or risks must be identified. A summary of the resource elements of the flight systems design concept, including key margins, must be provided. The rationale for, and derivation of, margin allocations including mass, power, communication link, pointing accuracy, etc., must be provided. Those design margins that are driving costs must be identified. Provide data in tables to show the current estimate of computer memory margin and computer processor utilization margin. A Master Equipment List must summarize component-level information for all hardware subsystems of the spacecraft, any other hardware elements, and instruments.

4. Science Payload. This section must describe the science payload for the investigation. Highlight any changes to the payload or individual instruments or their performance since submission of the proposal. Information pertinent to the accommodation of the instrumentation on the spacecraft must also be included. Subsystem characteristics and requirements must be described. Such characteristics include: mass, volume, and power requirements; pointing requirements; new developments needed; and a space qualification plan.

Include where appropriate: block diagrams, layouts, calibration plans, operational and control considerations, and software development. Any design features incorporated to effect cost savings must be identified. A summary of the resource elements of the instrument design concept, including key margins, must be provided. The rationale for margin allocation must be provided. Those design margins that are driving costs must be identified. Reference may be made to Section E of the CSR to avoid duplication.

5. Payload Integration. This section must characterize the interface between the instruments and the flight system. These include, but are not limited to: volumetric envelope, fields of view, weight, power requirements, thermal requirements, command and telemetry requirements, sensitivity to or generation of contamination (e.g., electromagnetic interference, gaseous effluents, etc.), data processing requirements, as well as the planned process for physically and analytically integrating them with the flight system. The testing strategy of the science payload, prior to integration with the spacecraft, must be discussed.
6. Manufacturing, Integration, and Test. This section must describe the manufacturing strategy to produce, test, and verify the hardware/software necessary to accomplish the mission. It must include a description of the main processes/procedures planned in the: fabrication and contamination control of flight hardware, development and configuration control of software, production personnel resources, incorporation of new technology/materials, and preliminary test and verification program. The environmental tests planned must be discussed and proposed test margins and durations for the environmental test program specified. Part burn-in requirements that will be used for the program must also be defined. Describe the approach for transitioning from design to manufacturing and specify data products which will be used to assure producibility and adequate tooling availability.

The approach, techniques, and facilities planned for integration, test and verification, and launch operations phases (including launch integration and processing), consistent with the proposed schedule and cost, must be described. A preliminary schedule for manufacturing, integration, and test activities must be included. A description of the planned end items, including engineering and qualification hardware, must be included.

7. Mission Operations, Ground, and Data Systems. This section must discuss mission operations and the ground operations support required for the proposed investigation. The planned approach for managing mission operations and all flight operations support, including mission planning and scheduling, command sequence generation, uplink commanding, trajectory tracking, and telemetry downlink and analysis must be discussed. Describe all inter-facility communications, computer security, or near real-time ground support requirements, and indicate any special equipment or skills required of ground personnel. Provide a staffing plan for both mission operations and science payload operations. Contact with the SOMO (Space Operations

Management Office) during the Concept Study is encouraged to better understand the options and associated costs for NASA-provided operations and communications services.

Proposers are free to proposed use of services from sources other than the NASA Space Operations Management Office (SOMO). Services provided by SOMO include support for communications, tracking, mission operations, flight dynamics, and data processing. Costs for such services, whether obtained from NASA or other sources, must be included in the cost estimate. Projects must conduct trade studies on the use of SOMO-provided services versus any proposed alternatives. Explorer projects may optionally conduct such studies in Phase A, but must conduct such studies no later than Phase B. In general, SOMO-provided services must be employed whenever they meet mission objectives at a life-cycle cost to the project or to the Office of Space Science (OSS) that is less than or equal to any proposed alternatives. SOMO will assist Explorer proposers in identifying SOMO services, prices, and cost trades. If OSS and SOMO agree that the proposed approach does not result in the lowest life cycle cost, OSS may direct the Explorer project to modify its approach. Information on NASA SOMO space communications capabilities and costing is given in the document, *NASA's Mission Operations and Communications Services*, available in the MIDEX Program Library.

The approach to the development of the ground data system, including the use, if any, of existing facilities including Government facilities, must be described. All usage of the Deep Space Network (DSN) and of any existing non-DSN facilities, including the Tracking and Data Relay Satellite System (TDRSS), must be explicitly described and costed as separate line items. Any mission-unique facilities must be adequately described. Include a block diagram of the Ground Data System (GDS) showing the end-to-end concept (acquisition through archiving in the appropriate data archive) for operations and data flow to the subsystem level. Describe all communications, tracking, and ground support requirements. Describe the space/ground link spectrum requirements and the licensing approach. The NASA Frequency Spectrum Management organizations can be used if the mission uses frequencies allocated to the government and the data transmitted is not used directly for commercial purposes. Describe the software design heritage and software development approach and its relationship to the flight system software development.

Specific features incorporated into the flight and ground system design that lead to low-cost operation must be identified. The use of any existing mission operations facilities and processes must be described, as well as any new facilities required to meet mission objectives.

8. Facilities. Provide a description of any new, or modifications to existing, facilities, laboratory equipment, and ground support equipment (GSE) (including those of the team's proposed contractors and those of NASA and other U.S. Government agencies) required to execute the investigation. The

outline of new facilities and equipment must also indicate the lead time involved and the planned schedule for construction, modification, and/or acquisition of the facilities.

9. Product Assurance, Mission Assurance and Safety. This section must describe the process by which the product quality is assured to meet the customer's specifications, including identification of trade studies, the parts selection strategy, and the plans to incorporate new technology. This section must also describe the product assurance plan, including plans for problem/failure reporting, inspections, quality control, parts selection and control, reliability, safety assurance, and software validation. In addition, investigators must be aware of mission assurance topics of recent Agency-level special emphasis for all NASA missions. Such topics include Red Team Reviews, subsystem-level Failure Mode Effects Analysis, Probabilistic Risk Assessment with its subset of analysis tools, Continuous Risk Management, and Software Independent Verification and Validation. Further discussion of these topics can be found in the document "MIDEX Safety, Reliability, and Quality Assurance Requirements," available from the MIDEX Program Library at <http://explorer.larc.nasa.gov/explorer/mel.html>.

G. MANAGEMENT PLAN

This section sets forth the investigator's approach for managing the work, the recognition of essential management functions, and the overall integration of these functions. This section must specifically discuss the decision-making process to be used by the team, focusing particularly on the roles of the Principal Investigator and Project Manager in that process. The management plan gives insight into the organizations proposed for the work, including the internal operations and lines of authority with delegations, together with internal interfaces and relationships with NASA, major subcontractors, and associated investigators. It also identifies the institutional commitment of all team members (including team members responsible for E/PO), and the institutional roles and responsibilities. The use of innovative processes, techniques, and activities by mission teams in accomplishing their objectives is encouraged; however, they must be employed only when cost, schedule, or technical improvements can be demonstrated and specific enabling assumptions are identified.

1. Team Member Responsibilities. This section must describe the roles, responsibilities, time commitment, and experience of all team member organizations and key personnel, with particular emphasis placed on the responsibilities assigned to the Principal Investigator (PI), the Project Manager, and other key personnel. In addition, information must be provided which indicates what percentage of time key personnel will devote to the mission, the duration of service, and how changes in personnel will be accomplished. (Note: The experience of the PI and science team members does not need to be included in this section since that is addressed in the science investigation section.)

- a. Organizational Structure. The management organizational structure of the investigation team must be described in the CSR. A Work Breakdown Structure (WBS) must be provided. The CSR must describe the responsibilities of each team member organization and its contributions to the investigation. Each key position, including its roles and responsibilities, how each key position fits into the organization, and the basic qualifications required for each position, must be described. A discussion of the unique or proprietary capabilities that each member organization brings to the team, along with a description of the availability of personnel at each partner organization to meet staffing needs must be included. The contractual and financial relationships between team partners must be discussed.

Summarize the relevant institutional experience in this section, and refer to supporting detail included in Section M2, Relevant Experience and Past Performance. If experience for a partner is not equivalent to, or better than, the requirements for the proposed mission, explain how confidence can be gained that the mission can be accomplished within cost and schedule constraints.

- b. Experience and Commitment of Key Personnel. Provide a history of experience explaining the relationship of the previous experience to each key individual's role; include the complexity of the work and the results.
 - i. Principal Investigator. The role(s), responsibilities, and time commitment of the Principal Investigator must be discussed. Provide a reference point of contact, including address and phone number.
 - ii. Project Manager. The role, responsibilities, time commitment, and experience of the Project Manager must be discussed. Provide a reference point of contact, including address and phone number.
 - iii. Other Key Personnel. The roles, responsibilities, time commitments, and experience of other key personnel in the investigation including Co-Investigators must be described.
2. Management Processes and Plans. This section must describe the management processes and plans necessary for the logical and timely pursuit of the work (including E/PO), accompanied by a description of the work plan. This section must also describe the proposed methods of hardware and software acquisition. The management processes which the investigator team proposes, including the relationship between organizations and key personnel must be discussed, including the following, as applicable: systems engineering and integration; requirements development; configuration management; schedule management; team member coordination and communication; progress reporting, both internal and to NASA; performance measurement; and resource management. This discussion must include all phases of the mission including preliminary analysis, technical definition, the design and development, and operations phases, along with the expected

products and results from each phase. Unique tools, processes, or methods which will be used by the investigation team must be clearly identified and their benefits discussed. All project elements must be covered to assure a clear understanding of project-wide implementation.

3. Schedules. The schedule and workflow for the complete mission life-cycle must be clearly defined, and the method and tools to be used for internal review, control, and direction discussed. Schedules for all major activities, interdependencies between major items, deliveries of end items, critical paths, schedule margins, and long-lead procurement needs (defined as hardware procurements required before the start of Phase C/D) must be clearly identified and discussed.
4. Risk Management. This section must describe the approach to, and plans for, risk management to be taken by the team, both in the overall mission design and in the individual systems and subsystems. Plans for using standard risk management tools, especially fault tree analysis, probabilistic risk assessments, and failure modes and effects analyses, must be described. Particular emphasis must be placed on describing how the various elements of risk, including new technologies used, will be managed to ensure successful accomplishment of the mission within cost and schedule constraints. Investigations dependent on new technology will be penalized for risk if adequate plans to ensure success of the investigation are not described. The top 3 risks and their mitigation plans must be discussed.

A summary of reserves in cost and schedule must be identified by Phase and project element and year and the rationale for them discussed. The specific means by which integrated costs, schedule, and technical performance will be tracked and managed must be defined. Specific reserves and the timing of their application must be described. Management of the reserves and margins, including who in the management organization manages the reserves and when and how the reserves are released, must be discussed. This must include the strategy for maintaining reserves as a function of cost-to-completion. All funded schedule margins must be identified. The relationship between the use of such reserves, margins, potential descope options, and their effect on cost, schedule, and performance must be fully discussed. When considering potential descope options, consider the investigation as a total system including instrument(s), spacecraft, ground system, launch services, and operations.

5. Government Furnished Property, Services, Facilities, etc. This section must clearly delineate the Government-furnished property, services, facilities, etc. required to accomplish all phases of the mission.
6. Reviews. This section must list the major project reviews expected to be conducted during the project's life cycle and the approximate time frame of each. The objective of each review must be indicated. Systems-level reviews will be chaired by the GSFC Systems Management Office. Allowance must

also be made for government-initiated independent assessment reviews, such as Confirmation Assessments, Independent Annual Reviews and Red Team Reviews. Note that regular reviews of the progress of the E/PO component of the missions must be held in the same way that progress on the scientific and technical aspects are reviewed.

7. Reporting. This section must clearly describe the approach to reporting progress to the Government and indicate the progress reviews the Government is invited to attend to provide independent oversight. The process, including the individual or organization responsible for reporting integrated cost, schedule, and technical performance must be discussed. A description of the information to be presented must be included. Planned project status reporting must include quarterly presentations to the governing Program Management Council (PMC), monthly status reporting to the Explorers Program Office, and after the Project Critical Design Review (CDR), a brief weekly summary of progress via a web-based NASA Office of Space Science reporting site.
8. Software Independent Verification and Validation (IV&V). This section must describe the plan to obtain software IV&V from the NASA IV&V Facility in Fairmont, West Virginia for all project-produced flight and ground software, or to obtain approval from the Fairmont facility to substitute a center or contractor IV&V process instead.

For Missions of Opportunity, in addressing the areas above, describe how the investigation team will interrelate with the sponsoring organization, organizationally, and managerially and provide:

- The status of the commitment from the spacecraft builder/owner or sponsoring organization to fly the proposed instrument or conduct the proposed investigation.
- If and how the proposed investigation relates to the spacecraft sponsor's overall mission objectives.

H. EDUCATION AND PUBLIC OUTREACH, NEW TECHNOLOGY, AND SMALL DISADVANTAGED BUSINESS PLAN

The education and public outreach, new technology, and small disadvantaged business plan must provide a summary of the benefits offered by the mission beyond the scientific benefits brought by obtaining and analyzing the desired scientific data.

1. Education and Public Outreach Activities. This section must build upon and extend the discussion of E/PO activities given in the proposal. See Appendix B of this document for guidance. As noted earlier in these Guidelines, it is expected that the Concept Study plans will be substantially refined and expanded beyond the level of detail contained in the original proposal. Plans for product development and dissemination, contributions to the training of underserved and/or underutilized groups in science and technology, arrangements with partners, schedules and budgets for activities, and etc., are to be defined in sufficient detail that they can be evaluated at an appropriate level of depth.

Where appropriate, references should be made to the Management Plan and other relevant sections for information on how the work is to be arranged, directed, implemented, reviewed, and reported. Letters of support/commitment from partners/subcontractors and resumes from key E/PO personnel must be included as appendices to the concept study report.

2. Small Disadvantaged Business and Other Minority Institutions. A summary plan is required specifying the proposed investigation's commitment to meet NASA's SDB and other minority institution participation goals as described in Section XIII of Appendix A of the AO. In addition, as also specified in Appendix A, subcontracting plans will be required to execute the contract option for investigation implementation. Phase A funds can no longer be used to develop subcontracting plans. Reimbursement for subcontracting plans can only be as an indirect, so-called bid and proposal, cost.
3. New Technology. This section must discuss how new technology relates to the proposed investigation, including: (1) insertion of new technology into the project, (2) transfer of new technology from the project to other projects or programs, and (3) commercialization of new technology. The functions that the new technology performs and how it will be demonstrated for the investigation must be described. Also to be discussed is the development of partnerships among space, non-space firms, educational, other nonprofit organizations, and government entities to facilitate technology development, transfer, and commercialization along with how the mission team will implement the transfer and/or commercialization.

I. TECHNICAL DEFINITION (PHASE B) PLAN

This section must describe the plans and products for the technical definition phase (Phase B) of the Project. The key mission tradeoffs and options to be investigated during the Phase B must be identified. This section must identify those issues, technologies, and decision points critical to mission success. These plans must include a detailed schedule and define the products (including a Project Plan) and the schedule for their delivery.

J. COST PLAN

The cost plan must provide information on the anticipated costs for phases A through E for the preferred baseline launch date. Section K contains guidance on information needed regarding the second MIDEX launch date. A detailed cost proposal is required for Phase B/C/D. Cost estimates are required for Phase E, including a description of the estimating techniques used to develop the cost estimates. (Note: see Section L for requirements for any Phase F costs.) A discussion of the basis of estimate must be provided with a discussion of heritage and commonality with other projects. Quantify and explain any cost savings that result from heritage. All costs, including all contributions made to the investigation, must be included. Proposers must complete a summary of total mission cost by fiscal year as shown in **Figure 1**,

Total Mission Cost Funding Profile. The purpose of this summary is to present all costs for the project *on one page*, by project phase (A through E), by participating organization, and by fiscal year. If obligation authority in excess of identified costs is required, the proposal must also indicate the authority needed by year.

In addition, for each phase of the investigation (A, B/C/D, and E) a Time Phased Cost Breakdown for each Work Breakdown Structure (WBS) element, as shown in **Figure 2**, must be completed. Use only the line items shown in Figure 2 that are relevant for each phase of the project. The purpose of this set of Figures is to provide detailed insight into how the project allocates funding during each phase of work.

The cost of the entire project must be summarized on one page, and presented in the format shown in **Figure 3**. The purpose of Figure 3 is to (1) provide detailed insight into project costs by cost element and (2) provide a basis for comparison of the project proposed cost with the evaluation team's independent cost analysis. Identify each reserve amount to the lowest level consistent with the proposed reserve management strategy. For example, if each subsystem manager will have spending authority over a reserve for the subsystem, each such amount must be identified separately. If more convenient, the reserve details may be shown in a separate table, with totals reported as shown in Figure 3. Show costs for all development elements by recurring and non-recurring components in the format of **Figure 4**. Show costs (NASA OSS and contributed) associated with each Co-Investigator in the format of **Figure 5**. All co-investigators must be included in Figure 5. Note that all contributions, including Co-I support, must be documented by a Letter of Endorsement.

Proposers must include all contributions provided by non-OSS NASA Centers, including Civil Servant services, as well as the cost for the use of Government facilities and equipment on a full-cost accounting basis. All direct and indirect costs associated with the work performed at NASA Centers must be fully costed and accounted for in the proposal and summarized using the template provided in **Figure 6**. The purpose of this data is twofold: 1) to determine those costs that are included in the NASA OSS cost but are not funded out of the MIDEX program, and 2) to determine civil service contributions that are not included in the NASA OSS cost. Teams should work with their respective NASA Centers to develop estimates for these costs.

Note that the definitions for cost element terms shown in the cost figures are given in Appendix A of this document. This is not to be confused with the elements of cost listed in 1.e below.

The inflation index provided in Appendix B (Table B4) of the AO must be used to calculate all real-year dollar amounts, unless an industry forward pricing rate is used. If something other than the provided inflation index is used, the rates used must be documented.

All costs shall include all burdens and profit/fee in real-year dollars by fiscal year, assuming the inflation rates used by NASA (provided above) or specifically identified industry forward pricing rates.

1. Definition, Design, and Development (Phase B/C/D) Cost Proposal. This section provides a detailed cost proposal for performing Phase B/C/D. The cost proposal should correlate with the plans set forth in the Science, Technical Approach, and Management sections of the concept study
 - a. Work Breakdown Structure. A Work Breakdown Structure (WBS) must be included for Phase B/C/D. The structure of the WBS should be consistent with the plans set forth in the Technical Approach and Management sections of the concept study and the Statement of Work provided as an Appendix to the concept study. The WBS shall be described to the subsystem level (e.g., Attitude Control System, Propulsion, Structure and Mechanisms) for the spacecraft and to at least the instrument level for simple instruments and to the major component level for more complicated instruments. All other elements of the WBS must be at least to the major task level (e.g., Project Management, Systems Engineering, Ground Support Equipment).
 - b. Workforce Staffing Plan. Provide a workforce staffing plan which is consistent with the Work Breakdown Structure. This workforce staffing plan must include all team member organizations and must cover all management, technical (scientific and engineering), and support staff. The workforce staffing plan must be phased by fiscal year. Time commitments for the Principal Investigator, Project Manager, Co-Investigators, and other key personnel must be clearly shown.
 - c. Proposal Pricing Technique. Describe the process and techniques used to develop the Phase B/C/D cost proposal. For portions of the cost proposal developed using a grass-roots methodology, provide the bases from which the estimates were derived and details on how the estimates were extrapolated from the bases. For portions of the cost proposal derived from vendor quotes/historical actuals/catalogue prices/etc. include sufficient information to understand the fidelity of the values. For portions of cost the proposal derived from analogies, describe the value of and the methodology for extrapolating the analogy. For portions of the cost proposal derived parametrically, provide a description of the cost-estimating model(s) and techniques used in the Phase B/C/D cost estimate. Discuss the heritage of the models and/or techniques applied to this estimate, including any known differences between missions contained in the model's data base and key attributes of the proposed mission. Include the assumptions used as the basis for the Phase B/C/D cost and identify those which are critical to cost sensitivity in the investigation. If any "discounts" were assumed in the cost estimates for business practice initiatives or streamlined technical approaches, describe how these have been incorporated in the cost estimate and will be managed by the investigation team.

- d. Phase B/C/D Time-Phased Cost Summary. Provide a summary of the total Phase B/C/D costs consistent with Figure 2. The Phase B/C/D cost summary should be developed consistent with the Work Breakdown Structure and must include all costs to NASA OSS along with all contributed costs. The Phase B/C/D time phased cost summary must be phased by fiscal year.
- e. Elements of Cost Breakdown. To effectively evaluate the Phase B/C/D cost proposals, NASA requires cost or pricing data as defined in FAR 15.401 and supporting evidence stating the basis for the estimated costs by the WBS levels used in Figure 2. This information is in addition to that provided in Figures 1 through 6. The proposal will include, but is not limited to the following elements of cost:
 - i. Direct Labor.
 - (1) Explain the basis of labor-hour estimates for each of the labor classifications.
 - (2) State the number of productive work-hours per month.
 - (3) Provide a schedule of the direct labor rates used in the proposal. Discuss the basis for developing the proposed direct labor rates for the team member organizations involved; the forward-pricing method (including midpoint, escalation factors, anticipated impact of future union contracts, etc.); and elements included in the rates, such as overtime, shift differential, incentives, allowances, etc.
 - (4) If available, submit evidence of Government approval of direct labor rates for proposal purposes for each labor classification for the proposed performance period.
 - (5) If Civil Servant labor is to be used in support of the Phase B/C/D study, but is not to be charged directly to the investigation, then this labor must be considered as a contribution by a domestic partner, subject to the same restrictions as other contributions by domestic or foreign partners. A discussion of the source of funding for the Civil Servant contributions must be provided.
 - ii. Direct Material. Submit a summary of material and parts costs for each element of the WBS.
 - iii. Subcontracts. Identify fully each effort (task, item, etc. by WBS element) to be subcontracted, and list the selected or potential subcontractors, locations, amount budgeted/proposed, and types of contracts. Explain the adjustments, if any, and the indirect rates (or burdens) applied to the subcontractors' proposed amounts anticipated. Describe fully the cost analysis or price analysis and the negotiations conducted regarding the proposed subcontracts. Phase A funds can no longer be used to develop subcontracting plans. Reimbursement for subcontracting plans can only be as an indirect, so-called bid and proposal, cost.
 - iv. Other Direct Costs.

- (1) Travel, Relocation, and Related Costs. Provide a summary of the travel and relocation costs including the number of trips, duration, and purpose of the trips.
 - (2) Computer. Provide a summary of all unique computer-related costs.
 - (3) Consultants. Indicate the specific task area or problem requiring consultant services. Identify the proposed consultants, and state the quoted daily rate, the estimated number of days, and associated costs (such as travel), if any. State whether the consultant has been compensated at the quoted rate for similar services performed in connection with Government contracts.
 - (4) Other. Explain and support any other direct costs included in the Phase B/C/D proposal in a manner similar to that described above.
- v. Indirect Costs.
- (1) List all indirect expense rates for the team member organizations. Indirect expense rates (in the context of this AO) include labor overhead, material overhead, general and administrative (G&A) expenses, and any other cost proposed as an allocation to the proposed direct costs.
 - (2) If the proposal includes support services for which off-site burden rates are used, provide a schedule of the off-site burden rates. Include a copy of the company policy regarding off-site vs. on-site effort.
 - (3) If available, submit evidence of Government approval of any/all projected indirect rates for the proposed period of performance. Indicate the status of rate negotiations with the cognizant Government agency, and provide a comparative listing of approved bidding rates and negotiated actual rates for the past five (5) fiscal years.
 - (4) Discuss the fee arrangements for the major team partners.

2. Mission Operations and Data Analysis (Phase E) Cost Estimate. This section provides a cost estimate for performing the Mission Operations and Data Analysis Phase (Phase E) portion of the mission. The Phase E cost estimates should correlate with the plans set forth in the Science, Technical Approach, and Management sections. In completing this section, the following guidelines will apply:

- a. Work Breakdown Structure. A Work Breakdown Structure (WBS) must be included for the Mission Operations and Data Analysis Phase of the mission. The WBS should be consistent with the plans set forth in the Technical Approach and Management sections and the Statement of Work that is provided as an Appendix.
- b. Cost Estimating Technique. Describe the process and techniques used to develop the Phase E cost estimate. For portions of the cost proposal developed using a grass-roots methodology, provide the bases from which the estimates were derived and details on how the estimates were extrapolated from the bases. For portions of the cost proposal derived from

vendor quotes/historical actuals/catalogue prices/etc. include sufficient information to understand the fidelity of the values. For portions of cost the proposal derived from analogies, describe the value of and the methodology for extrapolating the analogy. For portions of the cost proposal derived parametrically, provide a description of the cost-estimating model(s) and techniques used in your Phase E cost estimate. Discuss the heritage of the models applied to this estimate including any known differences between missions contained in the model's data base and key attributes of the proposed mission. Include the assumptions used as the basis for the Phase E cost and identify those which are critical to cost sensitivity in the investigation. If any "discounts" were assumed in the cost estimates for business practice initiatives or streamlined technical approaches, describe how these have been incorporated in the cost estimate and will be managed by the investigation team.

- c. Workforce Staffing Plan. Provide a workforce staffing plan (including civil service) which is consistent with the Work Breakdown Structure. This workforce staffing plan must include all team member organizations and must cover all management, manufacturing, technical (scientific and engineering), and support staff. The workforce staffing plan must be phased by fiscal year. Time commitments for the Principal Investigator, Co-Investigators, Project Manager, and other key personnel must be clearly shown.
 - d. Phase E Time-Phased Cost Summary. Provide a summary of the total Phase E costs consistent with Figure 2. The Phase E cost summary should be developed consistent with the Work Breakdown Structure and must include all costs to NASA OSS, along with all contributed costs. The Phase E time phased cost summary must be phased by fiscal year.
 - e. Elements of Cost Break Down. Provide cost or pricing data as defined in FAR 15.401 and supporting evidence stating the basis for the estimated cost including but not limited to the elements of cost described under section K.1.e above.
4. Total Mission Cost (TMC) Estimate. This section must summarize the estimated costs to be incurred in Phases A through E including: Concept Study (Phase A), Technical Definition (Phase B); Design and Development Phase (Phase C/D); Mission Operations and Data Analysis Phase (Phase E); launch vehicle, upper stages, and launch services; Deep Space Network and other ground system costs; and cost of activities associated with social or educational benefits (if not incorporated in any of Phases A through E). Figure 1 must be used to summarize these costs. The total mission cost estimate should be developed consistent with the Work Breakdown Structure. Detailed plans for any aspects of the mission not discussed elsewhere in the CSR must be discussed here. The funding profile must be optimized for the mission. Contributions not included in the NASA OSS cost must be clearly identified as separate line items.

5. Total E/PO Cost Estimate: This section must summarize the estimated costs to be incurred in Phases A through E of the investigation for the E/PO component. This summary should be consistent with and relate directly to the top-level E/PO budget lines in Figures 1 through 6 as appropriate and describe how these costs relate to the activities, products, programs, partnership arrangements, etc., defined in Section H.

FIGURE 1
TOTAL MISSION COST FUNDING PROFILE TEMPLATE
(FY costs* in Real Year Dollars, Totals in Real Year and FY 2002 Dollars)

Item	FY1	FY2	FY3	FY4	FY5	FYn	...	Total (Real Yr.)	Total (FY 2002)
Phase A	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
- Organization B									
- etc.									
Phase B	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Phase C/D	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Phase E									
- Organization A									
Launch services	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Ground Data System Dev	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
E/PO	\$	\$	\$	\$	\$	\$	\$	\$	\$
Other (specify)	\$	\$	\$	\$	\$	\$	\$	\$	\$
NASA OSS Mission Cost	\$	\$	\$	\$	\$	\$	\$	\$	\$
Contributions by Organization (Non-U.S. or U.S.) to:									
Phase A	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Phase B	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Phase C/D	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Phase E									
- Organization A									
Launch Services	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Ground Data System Dev	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
E/PO	\$	\$	\$	\$	\$	\$	\$	\$	\$
Other (specify)	\$	\$	\$	\$	\$	\$	\$	\$	\$
Contributed Costs (Total)	\$	\$	\$	\$	\$	\$	\$	\$	\$
Mission Totals									\$

* Costs must include all costs including fee

FIGURE 2
(Phased costs in Real Year Dollars, Totals in Real Year and FY2002 Dollars)

TIME PHASED COST BREAKDOWN BY WBS AND MAJOR COST CATEGORY					
WBS/Cost Category Description	FY1	FY2	...	Total (RY\$)	Total (FY2002\$)
Total Direct Labor Cost	\$	\$	\$	\$	\$
WBS 1.0 Management					
WBS 2.0 Spacecraft					
WBS 2.1 Structures & Mechanisms					
WBS 2.2 Propulsion					
etc.					
Total Subcontract Costs	\$	\$	\$	\$	\$
WBS # and Description					
:					
etc.					
Total Materials & Equipment Cost	\$	\$	\$	\$	\$
WBS # and Description					
:					
etc.					
Total Reserves	\$	\$	\$	\$	\$
WBS # and Description					
:					
etc.					
Total Other Costs	\$	\$	\$	\$	\$
WBS # and Description					
:					
etc.					
Fee					
E/PO					
Other (Specify)					
Total Contract Cost	\$	\$	\$	\$	\$
Total Other Costs to NASA OSS	\$	\$	\$	\$	\$
Launch Services					
Ground Segment					
E/PO					
Other (Specify)					
Total Contributions (Non-U.S. or U.S.)	\$	\$	\$	\$	\$
Organization A:					
WBS # and Description					
etc.					
Organization B:					
WBS # and Description					
etc.					
TOTAL COST FOR PHASE	\$	\$	\$	\$	\$

Figure 3 Fiscal Year Costs in Real Year Dollars (to nearest thousand)

(Totals in Real Year and Fiscal Year 2002 Dollars)

Cost Element	FY1	FY2	FY3	...	FYn	Total (RYS)	Total (FY2002\$)
Phase A							
Reserves							
Total Phase A							
Phase B							
Reserves							
Total Phase B							
Phase C/D							
Instrument A							
Instrument B							
Instr Integ, Assy & Test							
<i>Subtotal - Instruments</i>							
Spacecraft Bus							
Spacecraft Integ, Assy & Test							
Other Hardware Elements							
Launch Ops							
<i>Subtotal - Spacecraft</i>							
Proj Mgmt/Miss Analysis/Sys Eng							
Science Team Support							
Prelaunch GDS/MOS Development							
E/PO, Other*							
<i>Subtotal Phase C/D before Reserves</i>							
Instrument Reserves							
Spacecraft Reserves							
Other Reserves							
Total Phase C/D							
Phase E							
MO&DA							
Tracking Services							
E/PO, Other*							
<i>Subtotal Phase E before Reserves</i>							
Reserves							
Total Phase E							
Launch Services							
Total NASA OSS Cost	\$	\$	\$	\$	\$	\$	\$
Contributions*							
Total Contributions	\$	\$	\$	\$	\$	\$	\$
Total Mission Cost						\$	

*Specify each item on a separate line; include Education & Public Outreach, facilities, etc.

Figure 4
Phase C/D Development Costs
in Real Year Dollars (to nearest thousand)

Cost Element	Non-Recurring	Recurring	Total (RY\$)	Total (FY2002\$)
Instrument A *				
Instrument B*				
Instrument n *				
<i>Subtotal - Instruments</i>				
Structure and Mechanisms				
Attitude Control				
Power				
Subsystem n				
<i>Subtotal - Spacecraft Bus</i>				
Any other elements (specify)				
<i>Subtotal - Other elements</i>				
Total NASA OSS Development Cost				

* Specify each instrument by subsystem/components where possible

FIGURE 5
CO-INVESTIGATOR COMMITMENT AND COST
FUNDING PROFILE TEMPLATE
(FY costs in Real Year Dollars, Totals in Real Year and FY2002 Dollars)

	Phase B	Phase C/D	Phase E	Total (Real Year)	Total (FY 2002)
<i>NASA OSS Cost</i>					
Co-I #1 Name/Organization					
Percent Time					
Cost					
Co-I #2 Name/Organization					
Percent Time					
Cost					
Co-I #n Name/Organization					
Percent Time					
Cost					
Total NASA OSS Co-I Cost					
<i>Contributions</i>					
Co-I #1 Name/Organization					
Percent Time					
Cost					
Co-I #2 Name/Organization					
Percent Time					
Cost					
Co-I #n Name/Organization					
Percent Time					
Cost					
Total Contributed Co-I Cost					

FIGURE 6
NASA CIVIL SERVICE COSTS
FUNDING PROFILE TEMPLATE
(FY costs in Real Year Dollars, Totals in Real Year and FY2002 Dollars)

Item	FY1	FY2	FY3	FY4	FY5	FYn	...	Total (Real Yr.)	Total (FY 2002)
Workforce	\$	\$	\$	\$	\$	\$	\$	\$	\$
- NASA Center A									
- NASA Center B									
- etc.									
Facilities	\$	\$	\$	\$	\$	\$	\$	\$	\$
- NASA Center A									
E/PO, Other*	\$	\$	\$	\$	\$	\$	\$	\$	\$
- NASA Center A									
NASA Civil Service Costs included in NASA OSS Cost	\$	\$	\$	\$	\$	\$	\$	\$	\$
Contributions by NASA Centers									
Workforce	\$	\$	\$	\$	\$	\$	\$	\$	\$
- NASA Center A									
- NASA Center B	\$	\$	\$	\$	\$	\$	\$	\$	\$
- etc.	\$	\$	\$	\$	\$	\$	\$	\$	\$
Facilities									
- NASA Center A									
E/PO, Other*									
- NASA Center A									
Contributed NASA Civil Service costs	\$	\$	\$	\$	\$	\$	\$	\$	\$
Mission Totals								\$	

*Specify each item on a separate line.

K. CHANGES REQUIRED FOR AND IMPLICATIONS OF BEING THE SECOND MIDEX LAUNCHED UNDER THIS AO

In order to quickly execute a contract for the mission selected as the second launch under this AO, the proposer must provide sufficient information to understand the implications of this delay to the science investigation and to the implementation of the mission. The information should be provided in the following format:

Science Investigation Implications. Describe the implications to achieving the proposed science investigation objectives if the mission is delayed.

Implementation Plan Changes: Describe how the proposed implementation activities would be affected by the delay and include a revised version of the schedule presented in the baseline concept study. Describe in detail what tasks would be accomplished in the extended Phase B and provide the same level of information requested in the Technical Definition (Phase B) Plan section (Section I). If Phases C/D are modified, address any risks that might be added to the mission as a result of the delay and how those risks would be managed and mitigated. It is not expected that Phase E will change, but if it does, provide similar information as requested for previous phases.

Cost Plan Changes: If the work/cost content does not change from the baseline, only provide new versions of Figures 1, 3 and 4. The information in the Implementation Plan Changes section should correlate with the revised cost profile. If the content changes, then a new version of Figure 2 is required with sufficient explanation to understand the differences between the baseline costs and the alternate launch date costs. Inflation is not considered a content change.

NOTE:

1. The MIDEX NASA OSS cost cap applies to this alternative.
2. The level of funding available for the initial period of Phase B is unknown due to the uncertainties in the first mission's funding profile. The Team must plan an intelligent and efficient development approach to the delayed launch date with a revised funding profile which meets this new plan. If proposed funding levels for this option exceed the available annual resources, NASA will work with the Team to arrive at a mutually acceptable funding profile within the NASA OSS cap.

L. JUSTIFICATION AND COST PLAN FOR ANY PHASE F ACTIVITIES

Phase F activities, discussed in section 3.2.2 of the AO, include extended missions, guest investigator programs, general observer programs, and archival data analysis programs. The selections of MIDEX missions and missions of opportunity from the step 1 proposals were made primarily on the merit of the baseline proposed science. No prejudice or commitment to any attendant proposed Phase F activity was made at

selection. It is incumbent upon proposers, therefore, to fully discuss these project additions in the Concept Study Report.

In the Concept Study, sufficient data and justifications must be provided to enable analysis of not only the science value, but also the validity and viability of the concept and cost to provide these additions. All definitions, guidelines and constraints outlined in the AO and applicable to these additions are still valid for the Concept Study. Narrative descriptions, rationale, and data for these enhancements will not be page count limited. Conciseness and brevity, however, are encouraged.

Funding for Phase F activities is considered outside the AO cost caps, and will therefore result in a separate decision by NASA as to whether to accept or reject these proposed expansions to the baseline science mission. Sufficient clarity in the Concept Study Report must exist to allow contractual execution if NASA Downselects the mission or mission of opportunity and elects to include either or all of these additions.

This section is to also provide a cost estimate for performing any Phase F activities. In completing the cost section, the guidelines for Phase B/C/D apply.

Complete a summary of costs according using the format shown in Figure 7. Include a discussion of the estimating techniques used to develop the cost estimates. These costs do not count against the NASA OSS cost cap.

FIGURE 7
FUNDING PROFILE TEMPLATE FOR ANY PHASE F ACTIVITIES
(FY costs in Real Year Dollars, Totals in Real Year and FY 2002 Dollars)

Item	FY1	FY2	Fyn	Total (Real Yr.)	Total (FY 2002)
Extended Mission	\$	\$	\$	\$	\$
- Organization A					
- Organization B					
- etc.					
Guest Investigator Program	\$	\$	\$	\$	\$
- Organization A					
General Observer Program					
- Organization A					
Archival Data Analysis Program	\$	\$	\$	\$	\$
- Organization A					
Additions to NASA OSS Cost	\$	\$	\$	\$	\$

M. APPENDICES

The following additional information is required to be supplied with the CSR. This information can be included as Appendices to the CSR, and, as such, will not be counted within the specified page limit.

1. Letters of Endorsement. Letters of endorsement must be provided from all organizations participating in and critical to the investigation. This requirement also applies to all organizations making contributions. Letters of endorsement must be signed by both the lead representative from each organization represented on the team, and by institutional and Government officials authorized to commit their organizations to participation in the proposed investigation. If government funding is required to support a contribution, a letter of support or commitment is required from the government funding agency, signed by an official authorized to commit the agency. Signed letters of support or commitment must be provided from all E/PO partners or subcontractors detailing their commitment to or involvement in the E/PO effort.
2. Relevant Experience and Past Performance. Proposals must include a discussion of relevant experience and past performance by the major team partners in meeting the requirements of projects similar to the subject of this CSR. For this part of the CSR, we are seeking information about the partner organizations rather than individuals. Projects that ended more than 5 years ago need not be included in the discussion. The discussion of relevant experience and past performance must include a description of each project; its relevance to the subject of the CSR; the proposed performance and the actual performance; the proposed cost and actual cost; the proposed schedule and actual schedule; an explanation of any differences between proposed performance, cost and schedule and what was actually achieved; and points of contact for the past project's customer. If the customer for the past project was the United States government, then the contract number must be included along with current technical point(s) of contact and phone number(s). For projects that are not yet complete, the current projected performance, cost, and schedule must be used in place of actual values.

In evaluating the CSR, NASA will consider the past performance of the major partner organizations. The evaluation of past performance will not be arithmetic; instead, the information deemed to be most relevant and significant will receive the greatest consideration. Relevant experience will be viewed as the demonstrated accomplishment of work which is comparable or related to the objectives of the CSR. In conducting the evaluation, NASA reserves the right to use all information available.

The team is cautioned that omissions or an inaccurate or inadequate response to this evaluation item will have a negative effect on the overall evaluation, and while NASA may consider data from other sources, the burden of providing relevant references that NASA can readily contact rests with the team.

3. Resumes. Provide resumes for all key personnel identified in the Management section. Also provide resumes for key E/PO lead personnel. Include resume data on experience that relates to the job these personnel will be doing for the proposed investigation.
4. Statements of Work for each Contract Option. Provide draft Statement(s) of Work for all potential contracts with NASA. These Statement(s) of Work must (as a minimum) be for each contract option (i.e., Phase B/C/D, and Phase E) and clearly define all proposed deliverables (including science data) for each option, potential requirements for Government facilities and/or Government services, and a proposed schedule for the entire mission.
5. Mission Definition and Requirements Agreement. A draft Mission Definition and Requirements Agreement must be provided. An example of a Mission Definition and Requirements Agreement is provided in the MIDEX Program Library.
6. Orbital Debris Analysis. In compliance with NASA Policy Directive 8710.3 (NASA Policy For Limiting Orbital Debris Generation), all missions will need to conduct a formal assessment during Phase A of the orbital debris the spacecraft will create upon mission termination. NASA Safety Standard (NSS) 1740.14 states that the risk of human casualty per reentry event has to be less than 0.0001. For spacecraft at an inclination of 28 degrees, this translates into a total debris area for components and structural fragments surviving reentry of 8 m². If the assessment to be conducted during Phase A indicates that the spacecraft will produce a larger debris area, a proper disposal of the spacecraft upon mission termination will need to be specified in the Phase A report. NSS 1740.14 can be obtained at <http://www.orbitaldebris.jsc.nasa.gov/mitigate/nss1740/nss1740.html>.

This evaluation can be made with the Debris Assessment Software written and maintained by Orbital Debris Program Office at the Johnson Space Center. The software and additional information can be obtained at <http://www.orbitaldebris.jsc.nasa.gov/mitigate/mitigation.html>.
7. Data Management Plan. A draft Data Management Plan is required.
8. Incentive Plan(s). Draft Incentive Plans (if applicable) must be included with the concept study. Incentive Plans must outline contractual incentive features for all major team members. Incentive Plans must include both performance and cost incentives, as appropriate.
9. NASA PI Proposing Teams. The same guidelines as in AO Appendix B apply.
10. Technical Content of any International Agreement(s). Draft language for the technical content of any International Agreement(s) are required for all non-U.S. partners in the investigation. A sample agreement is available in the MIDEX Program Library. The draft language must include (i) a brief summary of the mission and the foreign partner's role in it, (ii) a list of NASA's responsibilities within the partnership, and (iii) a list of the non-U.S. partner's responsibilities in

within the partnership. Note that NASA prefers to establish agreements with government funding agencies, not with the institution which will be funded to perform the work.

11. Discussion on Compliance with U.S. Export Laws and Regulations. Provide an update to the discussion in the proposal. Investigations that include international participation, either through involvement of non-U.S. nationals and/or involvement of non-U.S. entities must include a section discussing compliance with U.S. export laws and regulations; e.g., 22 CFR 120-130, *et seq.* and 15 CFR 730-774, *et seq.*, as applicable to the scenario surrounding the particular international participation. The discussion must describe in detail the proposed international participation and is to include, but not be limited to, whether or not the international participation may require the proposer to obtain the prior approval of the Department of State or the Department of Commerce via a technical assistance agreement or an export license, or whether a license exemption/exception may apply. If prior approvals via licenses are necessary, discuss whether the license has been applied for or if not, the projected timing of the application and any implications for the schedule. Information regarding U.S. export regulations is available through Internet URLs <http://www.pmdtc.org> and <http://www.bxa.doc.gov>. Proposers are advised that under U.S. law and regulation, spacecraft and their specifically designed, modified or configured systems, components, parts, etc., such as the instrumentation being sought under this AO, are generally considered “Defense Articles” on the United States Munitions List and are therefore subject to the provisions of the International Traffic in Arms Regulations, 22 CFR 120-130, *et seq.*
12. Acronyms List.
13. References List (Optional) Concept studies may provide, as an appendix, a list of reference documents and materials used in the concept study. The documents and materials themselves cannot be submitted, except as a part of the concept study.

APPENDIX A

PROGRAM COST ELEMENT DEFINITIONS

Introduction

This is a short dictionary of definitions for the cost elements shown in the figures and tables and discussed in the body of this *Criteria and Guidelines for Concept Study* document.

Project Management/Mission Analysis/Systems Engineering

Project management costs include all efforts associated with project level planning and directing of prime and subcontractor efforts and interactions, as well as project-level functions such as quality control and product assurance. Mission Analysis includes preflight trajectory analysis and ephemeris development. Systems engineering is the project-level engineering required to ensure that all satellite subsystems and payloads function properly to achieve system goals and requirements. This cost element also includes the data/report generation activities required to produce internal and deliverable documentation.

Instruments

Instrument costs include costs incurred to design, develop and fabricate the individual scientific instruments or instrument systems through delivery of the instruments to the spacecraft for integration. Costs for instrument integration, assembly, and test are to be shown separately from instrument development. Costs incurred for integration of the instruments to the spacecraft are included in the Spacecraft Integration, Assembly & Test cost element (see below).

Spacecraft Bus

Spacecraft bus costs include costs incurred to design, develop, and fabricate (or procure) the spacecraft subsystems. Costs for integration and assembly are not included in this element. Component level test and burn-in is included in this cost element. System tests are included in Spacecraft IA&T (see below).

Spacecraft Integration, Assembly & Test (IA&T)

S/C integration, assembly and test is the process of integrating all spacecraft subsystems and payloads into a fully tested, operational satellite system. The total cost of IA&T for a satellite includes research/requirements specification, design and scheduling analysis of IA&T procedures, ground support equipment, systems test and evaluation, and test data analyses. Typical satellite system tests include thermal vacuum, thermal cycle, electrical and mechanical functional, acoustic, vibration, electromagnetic compatibility/interference, and pyroshock.

Launch Checkout & Orbital Operations

Launch checkout and orbital operations support costs are those involving pre-launch planning, launch site support, launch-vehicle integration (spacecraft portion), and the first 30 days of flight operations.

Pre-Launch Science Team Support

Includes all Phase B/C/D (pre-launch) support costs for the science team. (See MO&DA below for post-launch component.)

Pre-Launch GDS/Mission Operations Services (MOS) Development

Includes costs associated with development and acquisition of the ground infrastructure used to transport and deliver the telemetry and other data to/from the Mission Operations Center and the Payload Operations Center. (For more information, refer to *NASA's Mission Operations and Communications Services* document in the MIDEX Program Library.) Includes development of science data processing and analysis capability. Also includes pre-launch training of the command team, development and execution of operations simulations, sequence development, and flight control software. This element includes any mission-unique tracking network development costs.

Mission Operations and Data Analysis (MO&DA)

This cost element refers only to Phase E (post-launch) and has two major components: Mission Operations and Data Analysis. Mission operations comprises all activities required to plan and execute the science objectives, including spacecraft and instrument navigation, control, pointing, health monitoring, and calibration. Data analysis activities include collecting, processing, distributing and archiving the scientific data. MO&DA costs include post-launch all costs for people, procedures, services, hardware and software to carry out these activities. It includes post-launch science team support costs. It does not include costs of any “Phase F” activities.

“Phase F” Activities

Options for enlarging the science impact beyond the baseline mission, such as extended missions, guest investigator programs, general observer programs, or archival data analysis programs are termed “Phase F” activities. These costs do not count against the mission funding cap.

Tracking Services including DSN

This line item includes all costs associated with this service for the specific proposed mission profile. (Refer to NASA's Mission Operations and Communications Services, in the MIDEX Program Library).

Education and Public Outreach

Includes all costs associated with developing and implementing the proposed project's programs for education and public outreach.

Project-Unique Facilities

If the proposed project requires construction or lease of any ground facilities, include here only the portion of costs to be borne by the proposed project, with description of the nature and extent of any cost-sharing arrangements assumed.

Launch Services

Launch vehicles and services are either procured and provided by NASA to launch spacecraft under fixed price contracts, or provided by the proposer. Launch services can be either ELV or Shuttle opportunities. In the case of an ELV launch, launch service price includes procurement of the ELV, spacecraft-to-launch vehicle integration, placement of spacecraft into designated orbit, analysis, post-flight mission data evaluation, oversight of the launch service and coordination of mission-specific integration activities. In the case of a Shuttle launch, launch services cost based on payload weight/volume will be provided by the Space Shuttle upon request by the proposer. Costs will include mission unique, upper stage(s), and integration costs. (For more information, refer to the *MIDEX Expendable Launch Vehicles Services Information Summary Document* or the *MIDEX Space Shuttle Launch Opportunities Document* in the MIDEX Program Library.)

Reserves

In that NASA maintains no reserves for missions, reserves must include those project funds that are not allocated specifically to estimated resources, but are held against contingencies or underestimation of resources to mitigate the investigation risk. Reserves must be reported according to the proposed reserve management strategy. For example, if the reserve is divided into funds to be pre-allocated to the flight system and instrument payload, with another portion held at the project level, specific dollar amounts to fund each must be identified.

NASA Center Costs (all categories)

Additional costs borne by the project for NASA Center participation. For example, there may be additional project management/systems engineering costs, above those incurred by the spacecraft prime contractor, which are due to NASA employee participation. These costs must be reported on a full-cost accounting basis.

APPENDIX B

EDUCATION/PUBLIC OUTREACH
CRITERIA, REQUIREMENTS, AND GUIDELINES

I. EVALUATION CRITERIA

E/PO portions of the Concept Study Report (CSR) will be evaluated by appropriately qualified scientific, education, and outreach personnel. The results of those evaluations will be explicitly considered by the OSS Selecting Official as an integral part of the overall evaluation and selection process.

There are seven evaluation criteria against which proposed OSS E/PO activities will be evaluated --four general criteria and three specific criteria. Please note that the general criteria were revised in August 2001 after the release of the AO. These revisions are intended to simplify the proposers task of addressing the general criteria as well as simplify and streamline the evaluation process.

The general criteria to be applied to the evaluation of all proposals, which reflect requirements necessary for further consideration of a proposal, are:

- The quality, scope, realism, and appropriateness of the proposed E/PO program including the general intellectual linkage to the science objectives of the parent research proposal;
- The adequacy, appropriateness, and realism of the proposed budget including demonstration of effective use of funds;
- The capabilities and commitment of the proposer and the proposer's team to carry out the proposed E/PO program, including the direct involvement of one or more science team members in overseeing and carrying out the proposed E/PO program and the establishment or continuation of effective partnerships with institutions and/or personnel in the fields of education and/or public outreach as the basis for and an integral element of the proposed E/PO program; and
- The adequacy of plans for evaluating the effectiveness and impact of the proposed education/outreach activity.

To ensure that the goals and objectives of the OSS E/PO strategy are realized in practice, proposals will also be evaluated using the following specific criteria listed below. Based on the funding guidelines given in the AO, E/PO programs will involve the expenditure of substantial resources. Therefore, it is expected that proposed E/PO programs will have a breadth and depth commensurate with these resources. Such programs are expected to be multi-faceted in nature, address a number of different aspects of education and outreach contained in the specific criteria, and have state, regional, or national scope. The specific E/PO criteria are:

- For proposals dealing directly with or strongly affecting the formal education system (e.g., through teacher workshops or student programs carried out at

informal education institutions such as science museums and planetariums), the degree to which the proposed E/PO effort is aligned with and linked to nationally recognized and endorsed education reform efforts and/or reform efforts at the state or local levels;

- The degree to which the proposed E/PO effort contributes to the training of underserved and/or underutilized groups and their involvement in and broad understanding of science and technology;
- The potential for the proposed E/PO activity to expand its scope by having an impact beyond the direct beneficiaries, reaching large audiences, being suitable for replication or broad dissemination, or drawing on resources beyond those directly requested in the proposal.

Although creativity and innovation are certainly encouraged, note that neither of these sets of criteria focuses on the originality of the proposed effort. Instead, NASA seeks assurance that the proposer is personally committed to the E/PO effort and the mission PI and/or appropriate research team members will actively be involved in carrying out a meaningful, effective, credible, and appropriate E/PO activity; that such an activity has been carefully planned and will be effectively executed; and that the proposed investment of resources will make a significant contribution toward meeting OSS E/PO plans and objectives.

In order to provide further insight to prospective proposers about the meaning of these evaluation criteria (and to ensure that E/PO proposals are reviewed on a consistent basis), OSS has developed an Explanatory Guide to the Office of Space Science Education and Public Outreach Evaluation Criteria. This document was revised in February 2002 and is available through the MDEX Program Library or may be accessed following the directions in Section 3.7 of the AO. Navigation through this Explanatory Guide at its Web site is facilitated by internal links. This Guide is not an extension of the E/PO requirements or criteria but is meant to provide an easy-to-follow introduction to the OSS Education and Public Outreach Program using a series of Frequently Asked Questions (FAQs) followed by a detailed discussion of the E/PO review criteria. “Indicators” contained in that discussion are the ones used by reviewers as the basis for their evaluation. Therefore, all proposers are strongly urged to review this Explanatory Guide.

II. ASSISTANCE FOR THE PREPARATION OF E/PO PROPOSALS

NASA OSS has established a nation-wide support infrastructure of space science education/public outreach groups one of whose purposes is to directly aid space science investigators in identifying and developing high quality E/PO opportunities. This infrastructure provides the coordination, background, and linkages for fostering partnerships between the space science and E/PO communities, and the services needed to establish and maintain a vital national, coordinated, long-term OSS E/PO program. Of particular interest are two elements of this system (which are also described in more detail in the OSS education/outreach implementation plan referred to in Section 3.7 of the AO):

Four OSS science theme-oriented E/PO "Forums" have been established to help orchestrate and organize in a comprehensive way the education/outreach aspects of OSS space science missions and research programs, and provide both the space science and education communities with ready access to relevant E/PO programs and products; and

Seven regional E/PO "Broker/Facilitators" to search out and establish high leverage opportunities, arrange alliances between educators and OSS-supported scientists, and help scientists turn results from space science missions and programs into educationally-appropriate activities suitable for regional and/or national dissemination

Prospective proposers are strongly encouraged to make use of these groups to help identify suitable E/PO opportunities and arrange appropriate alliances. Proposers should be careful to note that these Forums and Broker/Facilitators have been established to provide help, but the responsibility for actually developing the E/PO program and writing the proposal is that of the proposer. Points of contact and addresses for all of these E/PO Forums and Broker/Facilitators may be found at <http://space.science.nasa.gov/education/resources/ecosystem/index.htm>.

III. PREPARATION AND SUBMISSION OF AN E/PO PROPOSAL

An E/PO proposal is to consist of a contiguous body, budget, and key personnel workforce information:

- The body of the E/PO proposal is limited to four pages and must include the following parts: a brief abstract of the proposed activity (not to exceed 800 characters); an expanded description of the E/PO objectives and planned activities; a description of the intended involvement of the Principal Investigator and/or key science team members in the proposed E/PO effort; a description of any educational personnel who are involved in the effort (resumes), including proposed partnership institutions (together with specific indicators of commitment on the part of partners where appropriate); a description of how the effort will be managed; and an explanation of the requested E/PO budget (including expenditures for Co-Is/subcontractors). Note that the mission PI or one of the science team members of the parent research proposal must have the prime responsibility for overseeing the implementation of the proposed E/PO activity. The responsible individual must be clearly identified in the body of the E/PO proposal. Details of organizational and management arrangements described in the Management section of the CSR may be included by reference and do not have to be repeated in this section of the proposal.
- The period of performance of an E/PO activity is generally expected to coincide with that of the proposed investigation throughout all phases including the data analysis phase. To the extent that the details are available, the E/PO budget must be summarized for its entire intended total period of performance, as well as for each individual year thereof, using the budget summary formats at the end of this Appendix. In addition, this E/PO budget must be integrated into the budget for the

entire proposed investigation as specified elsewhere in this document. Note that these budget summary sheets are not included in the page limits. This information is intended to help OSS assess the adequacy, appropriateness, and realism of the budget for the proposed E/PO program.

IV. ADDITIONAL INFORMATION

General questions about the OSS E/PO program may be directed to:

Rosalyn A. Pertzborn
Program Planning Specialist
Code S
Office of Space Science
NASA Headquarters
Washington, DC 20546
Email: rpertzbo@hq.nasa.gov
Telephone: 202/358-1953

E/PO Template #1
E/PO Program Budget

(FY costs in Real Year Dollars, Totals in Real Year and FY 2002 Dollars)

	FY1	FY2	FY3	FYn	Total (Real Yr.)	Total (FY 2002)
Personnel						
Subcontract #1						
Subcontract #2						
Subcontract #n						
Consultants						
Equipment						
Supplies						
Travel						
Other Direct Costs						
Facilities						
Administration						
Other Indirects						
Subtotal						
Cost Sharing						
TOTAL						

INSTRUCTIONS FOR E/PO BUDGET SUMMARY – TEMPLATE #1

- Provide, as attachments, detailed computations of all estimates in each cost category with narratives as required to fully explain each proposed cost as follows.
1. Personnel: Attachments must list the number and titles of personnel, amounts of time to be devoted to the project, and rates of pay including salaries, wages, and fringe benefits.
 2. Subcontracts/Partners/Co-I Institutions: Attachments must describe the work to be subcontracted, estimated amount, recipient (if known), and the reason for subcontracting. Enter the annual totals on this budget summary page. In addition, complete a more detailed budget summary form describing the subcontractor's/partner's/Co-I institution's use of NASA funds that the proposer requested through this solicitation (see Template #2 format).
 3. Consultants: Identify consultants to be used, why they are necessary, the time (number of days) they will spend on the project, and quoted daily rates of pay. State whether the consultant has been compensated at the quoted rate for similar services performed in connection with Government contracts.
 4. Equipment: List separately. Explain the need for items costing more than \$5,000. Describe basis for estimated cost. General purpose equipment is not allowable as a direct cost unless specifically approved by the NASA Contracting Officer. Any equipment purchase requested to be made as a direct charge under this award must include the equipment description, how it will be used in the conduct of the work proposed and why it cannot be purchased with indirect funds.
 5. Supplies: Provide general categories of needed supplies, the method of acquisition, and the estimated cost.
 6. Travel: Describe the purpose of the proposed travel in relation to the contract and provide the basis of estimate, including information on destination, number of trips, and number of travelers where known.
 7. Other Direct Costs: Enter the total of direct costs not covered by 1 through 6. Attach an itemized list explaining the need for each item and the basis for the estimate.
 8. Facilities and Administration (F&A) Costs: Identify F&A cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate. Provide the name, address, and telephone number of the Federal agency official having cognizance. If unapproved rates are used, explain why, and include the computational basis for the indirect expense pool and corresponding allocation base for each rate.
 9. Other Indirects: Enter the total of indirect costs not covered by 8. Attach an itemized list explaining the need for each item.
 10. Subtotal: Enter the sum of items 1 through 9.
 11. Cost Sharing: Enter any amount proposed. If cost sharing is based on specific cost items, identify each item and amount in an attachment.
 12. Total: Enter the total after subtracting item 11 from item 10.

E/PO Template #2
Subcontract Budgets
(Costs in Real Year Dollars, Totals in Real Year and FY 2002 Dollars)

	Subcontract #1	Subcontract #2	Subcontract #n
Personnel			
Consultants			
Equipment			
Supplies			
Travel			
Other Direct Costs			
Facilities			
Administration			
Other Indirects			
Subtotal			
Cost Sharing			
TOTAL (Real Yr.)			
TOTAL (FY 2000)			

INSTRUCTIONS FOR E/PO BUDGET SUMMARY – TEMPLATE #2

- Provide, as attachments, detailed computations of all estimates in each cost category with narratives as required to fully explain each proposed cost as follows.
 1. Personnel: Attachments must list the number and titles of personnel, amounts of time to be devoted to the project, and rates of pay including salaries, wages, and fringe benefits.
 2. Consultants: Identify consultants to be used, why they are necessary, the time (number of days) they will spend on the project, and quoted daily rates of pay. State whether the consultant has been compensated at the quoted rate for similar services performed in connection with Government contracts.
 3. Equipment: List separately. Explain the need for items costing more than \$5,000. Describe basis for estimated cost. General purpose equipment is not allowable as a direct cost unless specifically approved by the NASA Contracting Officer. Any equipment purchase requested to be made as a direct charge under this award must include the equipment description, how it will be used in the conduct of the work proposed and why it cannot be purchased with indirect funds.
 4. Supplies: Provide general categories of needed supplies, the method of acquisition, and the estimated cost.
 5. Travel: Describe the purpose of the proposed travel in relation to the project and provide the basis of estimate, including information on destination, number of trips, and number of travelers where known.
 6. Other Direct Costs: Enter the total of direct costs not covered by 1 through 5. Attach an itemized list explaining the need for each item and the basis for the estimate.
 7. Facilities and Administration (F&A) Costs: Identify F&A cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate. Provide the name, address, and telephone number of the Federal agency official having cognizance. If unapproved rates are used, explain why, and include the computational basis for the indirect expense pool and corresponding allocation base for each rate.
 8. Other Indirects: Enter the total of indirect costs not covered by 7. Attach an itemized list explaining the need for each item.
 9. Subtotal: Enter the sum of items 1 through 8.
 10. Cost Sharing: Enter any amount proposed. If cost sharing is based on specific cost items, identify each item and amount in an attachment.
 11. Total Estimated Costs: Enter the total after subtracting item 10 from item 9.

E/PO Template #3

Key Personnel

(Percent Time Committed/Direct Costs, Including Benefits,
in Real Year Dollars, Totals in Real Year and FY 2002 Dollars)

	FY1	FY2	FY3	FYn	Total (Real Yr.)	Total (FY 2002)
Institution 1						
PI (% time)						
PI (direct cost)						
E/PO lead (% time)						
E/PO (direct cost)						
Institution 2						
PI (% time)						
PI (direct cost)						
E/PO lead (% time)						
E/PO (direct cost)						
Institution n						
PI (% time)						
PI (direct cost)						
E/PO lead (% time)						
E/PO (direct cost)						

INSTRUCTIONS FOR E/PO BUDGET SUMMARY – TEMPLATE #3

Workforce staffing plan for key personnel must be phased by fiscal year. In tabular form, the Workforce Table for Key Personnel must give the names and intended work commitment for the mission PI and key E/PO personnel of the proposed project both in time (rounded to the nearest 0.01 of a Work Year typically of 1880 hours) and salary (without addition of overhead or fees - rounded to the nearest \$1K) for each year of the proposed period of performance.